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Observations on the Habits of the Proboscis Monkey, *Nasalis larvatus* (Wurmb), Made in the Brunei Bay Area, Borneo

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(Plates I-IV; Text-figure 1)

THE PROBOSCIS MONKEY, *Nasalis larvatus* (Wurmb) is a distinctive species of colobine monkey restricted in its distribution to the island of Borneo. Little is known of the biology of this species. It does not thrive well in captivity and thus is seldom found in collections of zoological parks. The San Diego Zoo has exhibited five specimens at various times between 1956 and 1963 (Clyde A. Hill, personal communication). One male survived four years. Eight monkeys were obtained by the Surabaja Zoo, Surabaja, Indonesia, in 1961 and all were still alive in August, 1963, when the birth of a baby occurred (Hilmi Oesman, personal communication). Pournelle (Sarawak Museum Journal, Vol. IX, No. 15-16, New Series) refers to records of a proboscis monkey kept in the Giza Zoo, Cairo, in 1899, another that lived 69 days in the London Zoo in 1902, and a third that survived two and a half years in Calcutta in 1902-4.

Perhaps because of its limited range, the monkey has received little attention from naturalists in the field, and as a result there are few data on its ecology and behavior. Much of the information available on the biology of the proboscis monkey under natural conditions is to be found in the publications of Allen & Coolidge (1940), Banks (1931), Chasen & Kloss (1931), Davis (1962) and Hose (1893). Schultz (1942) has described the growth and development of the species.

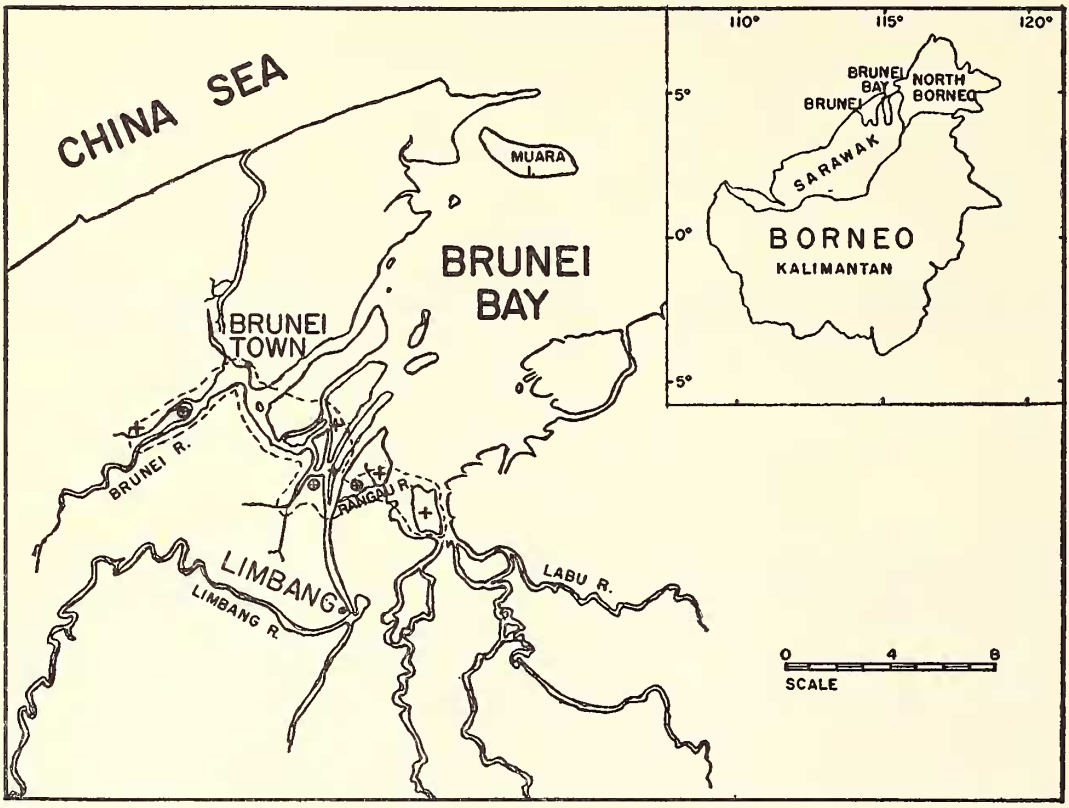
In November, 1962, my wife, Lynn, and I arrived in Borneo to film and study several aspects of the island's natural history. From the middle of November to March 1, 1963, we spent a total of 62 days observing the proboscis monkey. The study was interrupted between December 9 and February 1 by a revolution in Brunei. Text-fig. 1 shows the study area.

METHODS

Almost all observations were made in the tidal mangrove swamps around Brunei Bay where the monkeys were common. We averaged six hours a day in proboscis habitats, although on some occasions we spent ten or eleven hours in the field. In the early part of the study, observations were largely carried out between 8 a.m. and 5 p.m., while during February we were normally in the field between noon and 7:30 p.m. The actual time we could see or hear one or more individuals averaged about an hour a day.

Each day the monkeys had to be located. Sometimes this could be done at once; sometimes it took hours, even when we were concentrating on a single troop and knew in which trees they had slept the previous night. But once located, a troop often moved back into the mangroves away from the edge of the stream where it was impossible to follow.

All of my observations were made from an outboard motor boat. Following them on land would have been impossible, since the habitat was an impassable mass of mangrove roots and soft, slippery mud. The noise of a person attempting to penetrate this vegetation would certainly have panicked the animals. By remaining in our boat and thus appearing not unlike the rest of the river traffic—native Malays in outboards (of which there was an overabundance)—we could occasionally approach within thirty feet of the monkeys. If we stayed at a distance of one hundred yards and watched with binoculars, they would tolerate our presence indefinitely. Under such conditions, the monkeys, even if aware of being watched, did not display outward signs of nervousness. Often they would meet the observer's gaze for seconds on end with a generally calm and placid demeanor.



TEXT-FIG. 1. Geographic distribution of the proboscis monkey around Brunei Bay. Dotted line indicates geographic limits of study. Crosses indicate approximate centers of home ranges of the eight troops recorded. Crosses inside a circle indicate the location of the three troops that were observed closely.

DESCRIPTION

The coloration of the proboscis monkey is somewhat variable. The shoulders and upper back are yellowish brown to reddish brown, almost maroon in some individuals. Only the tips of the hairs are so colored, the proximal two-thirds being gray, and this gives a grizzled appearance to the pelage that increases as the pelage wears. The back is yellowish-grayish, forming a lumbar patch sharply set off from the color of the rest of the back and thighs. The tail is about the same color as the lower back, and sometimes, but not always, darker above than below. The belly is yellowish or grayish and sometimes washed with rufous. The legs and feet are yellowish-white and usually distinctly grizzled. A reddish-brown cap on top of the head is continued as a narrow nuchal stripe onto the shoulders. The throat and sides of the neck are cream color, sometimes washed with rufous. The naked parts of the face, including the nose, are approximately hazel in recently tanned skins. Color differences have been used as a primary basis for the recognition of the two subspecies, *N.l. larvatus* and *N.l. orientalis*. Davis (1962), however, has questioned the validity of these forms.

The second and third toes of the hind foot are often webbed to the middle of digit II (Schultz, 1942).

Sexual dimorphism in structure and size is pronounced. The most striking morphological difference between the sexes is the enormously enlarged, bulbous nose of the adult males (Plate I). In females and juveniles of both sexes the nose is snubbed upward but is of normal size. According to Davis (1962), the proboscis of the adult male cannot be inflated but moves considerably with movements of the mouth.

Allen & Coolidge (1940) record a male that weighed 52 pounds, and Schultz (1942) gives the mean weight of ten adult males as 45 pounds and that of females as 22 pounds. Thus, as Davis (1962) points out, males are twice as heavy as females, a sex difference that is equalled among cercopithecids only in some baboons.

In the wild the monkey's large size, long tail and rufous coloration make it impossible to confuse with any other Bornean primate.

Habitat

The major habitat-type of the proboscis monkey is invariably referred to as the nipa-mangrove association (Davis, 1962). My observations indicate that this habitat designation requires some qualification.

The nipa palm *(Nipa fruticans)* and the most common mangrove *(Rhizophora apiculata)* around Brunei Bay are both plentiful in the tidal regions of Borneo. Plate II, fig. 1, an aerial photograph of a tidal stream, shows some nipa and mangrove in association, but they usually vie for space in continuous patches. One or the other predominates. Also, I found that the monkeys had no use for the nipa, and I seldom found them among its fronds. One might leap into a nipa on its way out of another tree or flee from the water's edge through nipa at the observer's approach, but they showed no tendency to rest or sleep in the nipa or eat any part of this common palm. A list of the more common trees found in the tidal areas around Brunei Bay is given in Table I.

During the day the proboscis monkey's favorite tree is unquestionably the mangrove, while at night it prefers the pedada *(Sonneratia alba)*. The dense growth of the mangrove provides protection from the equatorial sun; the upper branches of the pedada afford protection from predators at night.

Habitat Relationships

We frequently encountered two other common primate species found in association with *Nasalis* in the Brunei Bay area: the silvered leaf-monkey *(Presbytis cristatus)* and the crab-eating macaque *(Macaca irus)*.

We found the silvered leaf-monkeys to be shy, somewhat less noisy and much more skittish than proboscis monkeys. They appeared to occupy a similar ecological niche in the Brunei Bay area, but they were not as common here and their troops were composed of fewer individuals.

Troops of macaques were about as plentiful as the proboscis troops, but normally they contained fewer individuals. Therefore, I believe the proboscis monkey was the most common primate in the areas we investigated.

Although the macaques often spent the night in pedada trees as did the proboscis monkeys and silvered leaf-monkeys, they spent their days on or near the ground, apparently feeding on a variety of nuts, fruits and crustacea, thereby utilizing the same habitat as *Nasalis*, but in such a way that competition was virtually non-existent.

Unquestionably the most common mammal in proboscis habitats was the large fruit bat *(Pteropus vampyrus)* that roosted by the tens of thousands on an island—Puala Siarau—in Brunei Bay. We could see them each evening as the sun set fanning out across Brunei in all directions for a night's feeding.

Porpoises were observed in a narrow, muddy tidal stream on one occasion.

Except for the common sandpiper *(Actitis hypoleucos)*, waders and sea birds were conspicuously scarce. Several species of land birds, however, were common in the tidal areas. These included the stork-billed kingfisher *(Pelargopsis capensis)*, forest kingfisher *(Ceyx erithacus)*, broadbill *(Cymbirhynchus macrorhynchus)*, imperial pigeon *(Ducula aenea)*, broad-billed roller *(Eurystomus orientalis)*, green pigeon *(Treron fulvicallis)*, Macklot's sunbird *(Nectarinia chalcostetha)* and the sea eagle *(Haliaeetus leucogaster)*.

The mangrove snake *(Boiga dendrophila)* was common, and the monitor *(Varanus salvator)* was also observed in proboscis habitats.

Table I. Common and Scientific Names of some of the Trees Characteristic of the Tidal Areas Inhabited by Proboscis Monkeys in the Brunei Bay Region (Source: Bertram E. Smythies)

Common Name	Family	Species
Dungun	Sterculiaceae	*Heritiera globosa*
Dungun	Sterculiaceae	*Heritiera littoralis*
Bakau	Rhizophoraceae	*Rhizophora mucronata*
Bakau	Rhizophoraceae	*Rhizophora apiculata*
Bakau	Rhizophoraceae	*Bruguiera gymnorhiza*
Bakau	Rhizophoraceae	*Bruguiera sexangula*
Api-api	Verbenaceae	*Avicenia alba*
Pedada	Sonneratiaceae	*Sonneratia alba*
Perepat	Sonneratiaceae	*Sonneratia caseolaris*
Nyireh bunga	Meliaceae	*Xylocarpus granatum*
Nyireh batu	Meliaceae	*Amoora cucullata*
Nipa, apong	Palmaceae	*Nipa fruticans*

The clouded leopard, *Felis nebulosa diardi,* is said to inhabit mangrove areas (Banks, 1931, 1949). G. S. Brown, former Conservator of Forests, North Borneo, killed one that had, together with a second individual, just killed a large male proboscis monkey near Muniang, at the northern end of the Trusan Kinabatangan, on March 19, 1950. We saw no evidence of this cat in the Brunei Bay area.

Population Density

Our search for the proboscis monkey extended about three miles up the Brunei River from Brunei Town and down river toward Brunei Bay, the Limbang River, and the little water-village of Rangau, a distance of ten miles. I have calculated rather roughly that our investigations covered a total of 14 square miles. However, broad rivers, villages within this area and hills probably accounted for one-half the total, or approximately seven square miles. In the remaining seven square miles, we located eight troops of proboscis monkeys totalling approximately 160 individuals, an average of 20 individuals per troop. This gave a population density of about 23 individuals—slightly more than one troop—per square mile of available *Nasalis* habitats in our study area. There were many sections of the mangrove swamps, however, where we never saw monkeys, so the density in terms of the area actually utilized would be higher than the figures given. In estimating density by this method I would be inclined to put the figure nearer one troop per three-quarters of a square mile of occupied habitat. However, three troops were studied carefully enough over a three-month period so that the boundaries of their home range were known. By estimating distances in our boat, I calculated that all three troops lived within approximately one-half a square mile. This second method of determining home range size seems inherently more accurate than the first, so I have concluded that the average home range is closer to one-half a square mile than three-quarters of a square mile.

By a proboscis troop's home range, I mean an area it inhabits exclusively under normal conditions. We saw no evidence that these monkeys establish a territory and defend it.

Troops of proboscis monkeys have been reported in literature to average about 15 or 20 individuals (Davis, 1962). Among the eight troops we studied, the number of individuals ranged from 12 to 27. Counting had to be done around sundown as the monkeys ascended the pedada trees for the night. Since they often did not begin appearing in the lower branches of the pedadas until one-half hour before sunset and climbed sporadically until almost dark, it was always difficult to get an absolute count. Counting monkeys in mangrove areas without pedadas was virtually impossible. The foliage was too dense and the monkeys were not silhouetted against the sky as they were in the pedada trees. An average-sized troop would generally occupy six or eight 30-foot pedada trees for the night, or two or three larger ones 60 feet or more in height.

On two occasions, however, we observed concentrations of proboscis monkeys in excess of 40 to 50 individuals. One such case occurred on the Labu River in Brunei's smaller enclave. Here, at dusk one evening, we counted 44 or 45 animals and the number actually present could easily have been as high as 50. Local Malays were under the impression that this group could be found in the same trees every night, but it was not observed on a second trip to the Labu region.

In another instance, one of the first days out in our boat we located a troop of monkeys about three miles west of Brunei Town on the Brunei River. At that time we counted 27 individuals. After defining the limits of their home range, we never found them outside these limits. Yet in the dusk one evening in February, a few days before we were due to leave Brunei, we counted about 60 monkeys together in this area silhouetted against the sky. On later occasions we located the monkeys again but could never attain a count of 27. The interpretation of this observation may be that a troop whose presence we did not know of had joined the troop we had previously observed. This was apparently a temporary situation, perhaps for just one night; and when the troops separated, some individuals may have exchanged positions.

Troops of proboscis monkeys appear to be rather loosely organized, at least when compared to the silvered-leaf monkey and macaque species occurring in the same area. Members of the latter species were usually within 50 yards of one another. At night they often slept in one tree, at least in nearby trees. In contrast, I saw a troop of proboscis monkeys spread out for about a third of a mile along a river bank, and in one case observed them in trees for the night about a thousand feet apart.

Proboscis monkeys invariably sleep singly except for mothers with young. With no more than a silhouette to go by, this characteristic behavior distinguishes proboscis monkeys from the other species, although they are also easily identified by their large size and long tails.

Solitary proboscis monkeys appeared to be

rare. Only three possible cases were observed during the course of this study. As is the rule in other primates, all of these individuals were males. On one occasion the troop we were most familiar with crossed a stream and began living in a section of the mangrove swamp we had not seen them use before. (Of the three troops we studied carefully, this was the only time we found a monkey outside the limits of the range we had defined for each troop). A few days later we found a full-grown male alone on the side of the stream the troop had left.

In a second instance, we found an isolated male perched in a mangrove overhanging the water. A search through the nearby trees, as we went by in our boat, revealed no other monkeys in sight. We found this male along the Segaliud River which empties into Sandakan Bay. He had a greatly inflamed and obviously infected area around an eye and about half of the cheek. This was the only monkey seen that did not appear to be in good health.

Among one of the other troops we regularly observed, we often found two or three old males apart from the troop high in favorite pedada trees in the heat of midday when the rest of the troop was nowhere in sight, having retired to the shade of the mangroves. These individuals were not solitary but merely peripheral. They regularly spent the night in the same trees as the rest of the troop.

Several incidents that came to our attention indicate that solitary, old male proboscis monkeys may sometimes behave in a very atypical manner. We were told of a huge male that wandered into Brunei Town and was caught by Malays. He was tied up so tightly that he injured himself trying to escape and had to be killed. After we left Brunei we received word that another exceptionally large male had entered Brunei Town. This one was also captured and died about a week later.

A photograph appearing in LIFE (September 14, 1959) shows a huge male proboscis monkey sitting on the edge of a small boat that had been lowered for him from a yacht. According to the caption, the monkey had been found "floundering" in the South China Sea, and after a short rest on the gunwale of the boat, he jumped back into the water. It is possible that this animal could have been swept out to sea accidentally, for around Kuching the tides are swift. The proboscis is, however, a strong swimmer, and I doubt that an adult male could involuntarily be carried far by currents from emptying rivers. Instead, these three incidents may have resulted from varying degrees of dotage in old males.

Old males appeared to dominate to a limited extent the other monkeys in the troop. But the only way I noticed this dominance expressed was by the utterance of a prolonged, nasal snort. Squabbles over trivial things like a position on a branch or a handful of leaves frequently erupted in the group and were invariably accompanied by loud shrieks. At such times one or more old males emitted this lengthy snort, whereupon the group quieted down and the disturbance ceased.

The shrieks of the proboscis and the silvered leaf-monkey are very similar, and we found we were unable to identify the species when we heard only these sounds. However, if the group were proboscis, the nasal snort of an old male would soon be heard.

Except when the old male made his prolonged snort, all animals appeared to behave much alike toward each other. The only specific relationship I observed was between mother and young. I had little chance to study this relationship but noticed that the infant was always carried on the chest, clinging to the mother with all fours if necessary. When a mother sat quietly, the young often moved away from her, but at the slightest provocation it would race back to the female (Plate II, fig. 2).

We were told in Brunei, where shooting monkeys is not prohibited, that if a proboscis monkey were only wounded, others would come to its rescue and carry it off before the hunter could reach it. Although this is possibly true, my own observations provide no verification. In fact, we had one experience that appears to support the contention that the social bonds between members of a proboscis troop are not as strong as in the case of some primates. On this occasion we had panicked an entire troop by running our boat through some mangroves to the base of a huge dungun tree the troop was in. In the confusion and panic, a mother fled, leaving her young stranded on a limb some 30 feet over our heads. Left alone, the infant screamed wildly to be rescued. However, neither the mother nor other members of the troop returned to rescue or defend the infant while we were present.

VOCALIZATION

I have referred to the typical vocalization of the older males as a prolonged, nasal snort. The sound really defies words. There is a hollow resonance to it, and I have been tempted, also, to call it a nasal "growl." It is a lazy sound and lacks urgency or fear, although the old males constantly emit it to register displeasure.

Another characteristic vocalization of the proboscis monkey is a nasal "honk." This sound is given by an adult in time of danger. If the in-

truder is an unfamiliar sight to the animal, but still at some distance, the monkey might be seen perched with all fours together on a limb, head and shoulders pushed forward and mouth tautly open in a big "O." At such times it may give a few sharp honks, its nose rigidly straightening out and up with each honk.

If the observer can remain hidden until the monkey has approached to within five or ten feet, it may turn and flee without a sound when it discovers the human being. The actions of the monkey will then alarm the others and the whole troop will disappear. If a person in a boat moves quickly under or among a troop, startling them all, there will be a great crashing and leaping of monkeys and swaying and shaking of trees to the accompaniment of loud shrieks and honks. These shrieks are the most regularly heard sound. Whenever the troop is highly excited or frightened, or individuals are fighting, these shrieks will invariably be emitted.

One other vocalization recorded was a contented mewing note I heard given by a juvenile in the Surabaja Zoo while it was eating.

Movements

The boundaries of a home range are normally determined by hills or mountains and large streams and rivers. Where tidal lowlands are broad enough, home ranges meet, the boundaries being determined by small streams or a hiatus in the preferred vegetation.

Troops appear to move through their home ranges at random. I have watched a troop spend five consecutive nights in pedada trees within 600 feet of each other, but on the following morning travel more than a quarter of a mile in one hour through the mangroves for no reason apparent to me. This rate was as fast as any I recorded for a similar distance. When frightened, the monkeys were observed rushing away through the trees at almost 150 yards a minute for distances under 100 yards.

Since streams of all sizes lace the tidal swamps to drain the area at low tide, these are frequently crossed by swimming if branches do not reach far enough to permit the monkeys to cross in the trees. Certain points where a tree may hang over the water or where a stream may narrow are preferred crossing places. I discovered four such places among three troops. But except for locating and determining the use of these spots, I could determine no other regularity to their movement, no favorite routes or pathways, no schedule or cycle by which they moved about.

Ivan Sanderson states in "The Monkey Kingdom" that the proboscis monkey "will drive other animals and especially monkeys from territory they consider to be theirs." My observations do not confirm this. I never observed these monkeys defending a certain area, either physically or by vocalization. On one occasion I watched a troop of silvered leaf-monkeys move through the home range of a proboscis troop without incident, sometimes passing within a few yards of proboscis individuals. In "The Monkey Kingdom" and in "Living Mammals of the World," Sanderson also states that proboscis monkeys like to "bask in the sun," indulge in "strenuous exercise" and "regularly go swimming for pleasure." None of my observations support these statements.

Activity

The monkeys apparently leave their sleeping tree very early. Although once I reached some trees at 6 a.m. where I had left a troop the night before, the monkeys had already left. Three or four other times I arrived about dawn at trees I had seen the monkeys enter the evening before, but never arrived early enough to see them descend the pedadas.

The monkeys eat and are active at all times of the day, but their greatest period of activity is from late afternoon until dark. This is also probably the time at which the greatest volume of food is consumed. During most of the day the monkeys are well hidden among the mangroves and observing them is difficult. With one troop, though, a small navigable stream penetrated its territory, and we could get close to it and film the monkeys during the middle of the day. Often we would cut the motor and tie up to a handy limb and wait quietly, suspecting the monkeys were near. An hour might go by without a sound, and then with luck we might finally hear a shriek nearby, followed by the prolonged nasal snort of an old male.

In mixed cover I never succeeded in determining the kinds of trees in which the monkeys preferred to spend the night. But where pedada trees exist, the monkeys invariably spend the night among their branches (Plate IV). There seems to be good reason for this. The monkeys like the leaves, and food is no more than an arm's length away. Also, since pedadas grow taller than the mangroves, they serve as a convenient look-out. They are generally tallest along the water's edge and here the monkeys most frequently spend the night. No doubt such sites offer the best protection from the clouded leopard.

In times of danger the monkeys are often so situated that they have the option of leaping into the surrounding trees or into the water. Hilmi Oesman, board member of the Surabaja Zoo, has

assisted in capturing proboscis monkeys in Kalimantan and explained how it is done. The monkeys are approached at night from the land so that they jump into the water. A semi-circle of men in boats prevents them from reaching the safety of the far shore, and they are captured in the water.

Apparently the monkeys do not normally move about after they have settled down for the night. On one occasion, I made a mental note of the location of several members of a troop at sundown and then returned about midnight with a good spotlight. I could determine no movement about the trees until a few individuals carefully climbed into higher branches as I approached.

Locomotion

In the trees the crashing leaps of the proboscis are similar to those of langurs. We never saw them brachiate, although they might hang idly with one or two hands or move leisurely a yard or so without the use of their feet. When something disturbs a troop and they set off through the trees, the noise of breaking and cracking branches can be heard a long way off. We were often able to locate and identify the monkeys by no more than the sound of breaking branches.

The proboscis appears to have an utter disregard for safety. I have seen individuals drop from high limbs 25 feet to branches below and am confident they did not know exactly where they would land when they left the limb. They will rush onto a dead branch as readily as a live one. When it snaps and falls, they fall with it, looking for the nearest thing to grab in their downward plunge. Accidents, however, appear to be common; healed bone fractures were present in 28% of the 25 skeletons examined by Schultz (1942).

Among the primates, the proboscis monkey is no doubt in a class by itself as a swimmer. It swims with a strong doggy-paddle stroke aided by partial webbing on the hind feet. It also swims well under water. On one occasion, a young adult swimming across a stream dived as we approached in a boat and swam at least 15 feet under water to the bank of the stream (Plate III, fig. 2). On another occasion we witnessed a spectacular diving exhibition by members of a troop crossing a stream. The majority of the monkeys leaped out of the upper branches of a tall dungun tree that leaned over the water (Plate III, fig. 1). By focusing a telephoto lens on one of the branches, I determined its height above the water to be 53 feet. Not all leaped from such heights. A couple of smaller individuals jumped in from the lower branches of a nipa. They leaped out of the tree in such rapid succession that two, and at least once three, were in the air at one time. In less than 30 seconds, the entire troop of 18 or 20 monkeys had plunged from the tree. They fell in an ungainly, spread-eagle position and belly-flopped into the water with a resounding smack. The momentum of the leaps carried them about halfway across the 75-foot-wide stream and they completed the crossing by swimming. I have found no evidence that an act like this has ever been observed before, and was fortunate to have been able to film it with a motor-driven camera. In the 62-day study, we observed a scene of this kind only once. This act, and the fact that we observed proboscis monkeys in the water so seldom, support the view that they swim only when necessary and not for pleasure.

Feeding Behavior

While in Kuching. Tom Harrisson told me that the favorite food of the proboscis monkey was the hypocotyl or long bean of the mangrove. We never observed wild individuals feeding on mangrove beans, nor could I induce captive proboscis monkeys at the Surabaja Zoo to accept them, although they devoured the mangrove leaves. Sanderson states in "Living Mammals of the World" that proboscis monkeys feed upon "certain leaves notably bamboo." Bamboo is uncommon in the lowland areas around Brunei Bay, and the monkeys were never observed in or near it.

My observations indicate that at least 95% of the diet of the proboscis monkey consists of leaves. The pedada leaves are probably favored, but mangrove leaves are eaten regularly. In fact, because of the abundance of these trees, mangrove leaves probably make up a larger share of the monkeys' diet than any other variety.

I believe the monkeys do much greater damage to the pedadas than to the mangroves. The pedadas are generally tall and rise above the mangroves and nipas and are a favorite place to sleep. Though the monkeys eventually circulate through their entire home range, they may spend as much as a third of their nights in a particular group of trees. Here, for two or more hours every evening, the troop may feed on the leaves. In three months' time we saw one group of trees become noticeably thinned out. Some of the branches were completely stripped. Intensive feeding on the pedadas may result in the death of the trees. We saw pedada trees in various stages of decimation, from the fully-leaved trees to dead ones, within a few hundred yards of each other in areas frequented by the monkeys.

The monkeys will eat the pedadas in all stages

of growth, but this is not the case with the mangrove. *Rhizophora apiculata* is the most common species around Brunei Bay. The new leaf sheath of this species forms a long, thin, bright red cone which the monkeys ignore in feeding, preferring the thicker leaves around it. Thus, this mangrove is not stripped of its leaf-buds.

Within the thick groves of mangroves, there is little variety in the choice of leaves, but along the stream banks there is a wider selection. Here, where they often feed near the ground, we observed them eating tender vines and shoots as well as leaves, but still rejecting many of the plants at hand.

In addition to leaves, the proboscis monkey also probably consumes some fruits and flowers. The fruit of the pedada is a likely candidate, for I observed a captive do so, but I never observed wild monkeys eating it. They were never observed feeding on flowers, either, but the tidal swamps around Brunei Bay were almost devoid of flowers from November through March.

It has also been suspected that the proboscis monkey will eat the huge, round, segmented fruit of the nipa palm, but I am inclined to doubt this. The fruit may be too coarse and too difficult for the monkey to get at. I did discover a large orang-utan pulling one apart on the Segaliud River.

In feeding, the monkeys often take a leaf into the mouth directly and bite it off. The movements are executed in a leisurely manner. If the food is several inches from their mouth, they may choose to pluck off a few leaves at a time or pull the branch over and chew off the leaves, stuffing them into their mouth with their hands if the volume requires it. The feet may also be used for pulling in branches, although I never saw them using their feet to put leaves into their mouth. In the typical feeding position, the monkeys face away from the trunk and toward the foliage on a horizontal limb. Holding onto a branch with one hand, they reach out in all directions with the other.

Status of the Species in Borneo

Several factors contribute to the protection of the proboscis monkey in Borneo. The species is legally protected in Sarawak, North Borneo and Kalimantan. In Brunei, although the Chinese consider the meat a delicacy, few will stray far from their shops to hunt the animals. The Malays are not hunters, either. In fact, we never saw anyone hunting the monkeys in Brunei, although it is not illegal.

The occurrence of the proboscis monkey in a relatively inaccessible habitat that has little economic value to man is perhaps the best guarantee of its survival.

Summary

Sixty-two days were spent studying and filming the proboscis monkey in Borneo. Observations were made from a small boat along tidal streams around Brunei Bay. For about one hour a day we were within sight or sound of one or more monkeys.

Proboscis monkeys live in troops and occupy home ranges of one-half a square mile or more. The troops are loosely organized and interchanges of individuals between troops was indicated.

Proboscis monkeys are large, heavy-bodied monkeys. Older males can weigh over fifty pounds, more than twice the weight of the average female. They move about with typical langur-like leaps, especially when frightened. The monkeys seldom seek the water, but are excellent swimmers both on the surface and under water. They are inveterate leaf-eaters. Probably less than 5% of their diet is composed of other vegetation.

Proboscis monkeys are the most plentiful monkeys in the Brunei Bay area. Their preference for mangrove swamps has not placed them in conflict with man and is their best guarantee of survival.

Acknowledgments

Much of the success of our proboscis monkey project can be credited to my wife, Lynn. She withstood blistering heat, mid-day downpours, hours on a cramped boat, mosquito and fly bites (91 on one leg at one count) to continually assist with the photography, note-taking and maneuvering of the boat.

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Explanation of the Plates

Plate I

Fig. 1. The only adult male proboscis monkey in captivity in 1963. Photographed at the Surabaja Zoo, Surabaja, Indonesia.

Plate II

Fig. 1. Nipa palms and mangroves grow along one of the tidal streams that empties into Brunei Bay.

Fig. 2. Adult female watches photographer as her young dangles from a nearby branch.

Plate III

Fig. 1. Proboscis monkeys leap toward the opposite bank of a stream from limbs up to 53 feet above the water.

Fig. 2. A young adult swims a tidal stream.

Plate IV

Fig. 1. Proboscis monkeys in the tops of pedada trees at sundown. Three of eight monkeys are clearly visible.